A SANITARY AND BACTERIOLOGICAL SURVEY OF RUSTICO BAY AND WHEATLEY RIVER, PRINCE EDWARD ISLAND SHELLFISH GROWING AREA # 3

by

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FOREWORD

This report is the result of a joint investigation by the Environmental Protection Service and the Prince Edward Island Department of the Environment.

Without the excellent cooperation and assistance provided by the Prince Edward Island Department of the Environment, this investigation would not have been possible. The author, however, is completely responsible for the interpretation of the data and the conclusions of this report.

ABSTRACT

A sanitary and bacteriological survey of Rustico Bay and Wheatley River, Prince Edward Island, was conducted from June 28 to August 19, 1976. The purpose of this survey was to reassess the present classification of this area for the harvesting of shellfish.

A total of 186 water samples from 31 locations were analyzed for fecal coliform bacteria. In addition, fecal coliform isolates and fecal streptococci analyses were conducted on samples from selected sampling stations following a major rainfall on July 14.

Sanitary and bacteriological information indicates that Rustico Bay consistently meets water quality criteria for an approved shellfish harvesting area and should remain opened to shellfishing.

The bacteriological data indicate that the upper portion of the Wheatley River does not consistently meet water quality criteria and suggest the possibility of an unidentified source of domestic waste to the River. The Wheatley River below the existing closure line exceeds bacteriological standards for an approved shellfish harvesting area following a major rainfall event. Sanitary information reveals that the outfall from a campground below Oyster Bed Bridge poses a potential threat of domestic waste discharge.

It is recommended that Rustico Bay remain open to shellfish harvesting but that two new closures be implemented on the Wheatley River as indicated in Figure 8 of this report.

RESUME

Du 28 juin au 19 août 1976, une étude sanitarie et bactériologique des eaux de la baie Rustico et de la rivière Wheatley (Ile-du-Prince-Edouard) a été effectuée afin de réévaluer leur classification coquillière.

On a compté les coliformes fécaux de 186 échantillons d'eau provenant de 31 endroits; on a en outre analysé des isolats de coliformes et compté les streptocoques fécaux d'autres échantillons recueillis dans des stations choisies, après les fortes précipitations du 14 juillet.

Il en est ressorti que la baie satisfait constamment aux critères de qualité de l'eau convenant à un secteur coquillier et qu'elle devrait rester ouverte à la récolte.

Les données bactériologiques montrent que l'eau de l'amont de la rivière Wheatley ne satisfait pas constamment aux critères qualitatifs et qu'elle aerait polluée par des eaux d'égout d'origine indéterminée. Après de fortes précipitations, la rivière, en aval de la ligne actuelle de fermeture, s'écarte des normes bactériologiques exigées pour un secteur conchylien. Les données prouvent que les égouts d'un terrain de caomping en aval d'Oyster Bed Bridge constituent un risque de contamination.

On recommande que la baie Rustico reste ouverte à l'exploitation des mollusques mais que la récolte soit interdite dans deux nouveaux secteurs de la rivière Wheatley (voir la figure n^{o} 8).

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1. INTRODUCTION

From June to August, 1976, the Environmental Protection Service conducted a sanitary and bacteriological survey of Wheatley River and a portion of Rustico Bay, P.E.I. (Shellfish Area P.E.I.-3).

The survey data are presented by sector as shown in Figure 1. Sector I includes most of Rustico Bay while Sector II includes Wheatley River and a small portion of Rustico Bay.

The purpose of this survey was to re-evaluate the extent of fecal pollution in the area and to review the restriction that applies to shellfishing. High levels of fecal coliform bacteria were observed in shellstock samples taken during 1975 by the P.E.I. Dept. of Environment and these originated from the open portion of the Wheatley River. At present shellfishing is prohibited as defined in Schedule F of the Prince Edward Island Fisheries Regulations (3-6),as follows:

> "The waters of Wheatley River including Crooked Creek, Queens County, upstream of a straight line drawn South 69°20' East astronomic from Oyster Survey Monument No. 101A on the west shore of the river, to Oyster Survey Monument No. 101B on the east shore, both shown on the plan showing Oyster Leases in the Rustico Bay area."

The most recent bacteriological survey of this area was completed in 1966 by Kindrasky and Debellefeuille (1). This survey concluded that the bacteriological water quality throughout the area was satisfactory during periods of dry weather but that the Wheatley River system is markedly sensitive to landwash pollution following heavy rainfall. As a results, no changes in the existing closure line were recommended or implemented.

Sanitary and bacteriological surveys of shellfish growing water are routinely carried out by E.P.S. The objective of these surveys is to determine if direct harvesting of shellfish is acceptable. From a public health standpoint, the principal purpose is to detect the occurrence of disease-causing organisms that may be accumulated by shellfish if domestic sewage or animal wastes reach their environment.

To assess the degree of fecal pollution in water, the fecal coliform "Most Probable Number" (MPN) test is currently used in the Canadian Shellfish

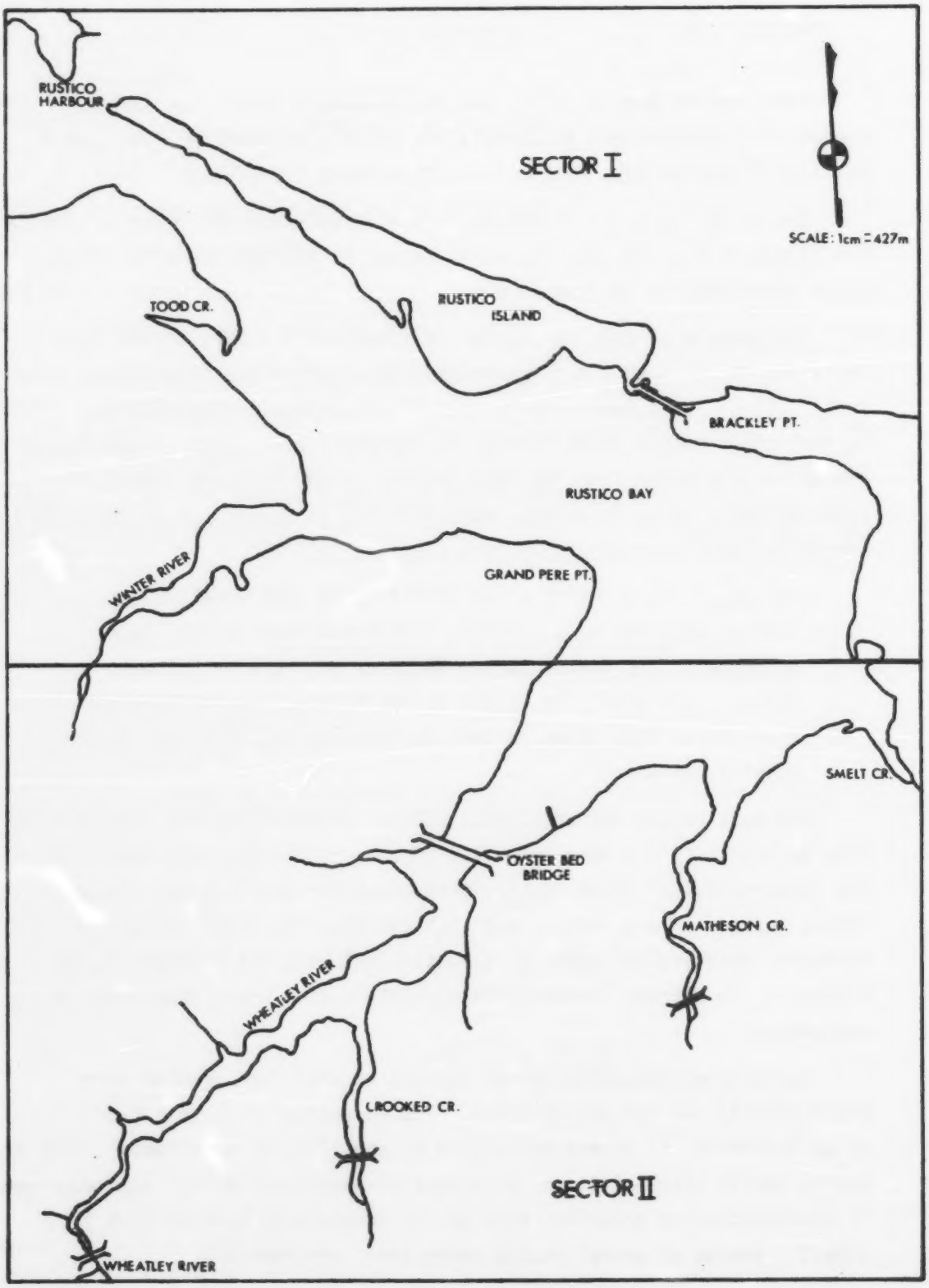

FIGURE 1 MAP OF SURVEY AREA SHOWING LOCATION OF SECTORS

Sanitation Program. Water is considered acceptable if the median of the test results at a sampling station does not exceed 14 MPN per 100 ml, and if not more than 10 percent of the test results exceed 43 MPN per 100 ml (2).

Before areas are designated contaminated or approved, however, all factors that have a bearing on potential contamination levels are considered in addition to the bacteriological results.

2. MATERIALS AND METHODS

2.1 Sample Collection

Water samples were collected in sterile glass bottles of 100 or 250 ml volume using a rod-sampling device to lower the bottles to a depth of about 2 feet.

All samples were stored in an insulated container, transported, and processed in a mobile laboratory within two to three hours after collection.

2.2 Bacteriological Analyses

Fecal coliform tests were performed on all samples using the "Most Probable Number" (MPN) Technique (3). Three 5-tube MPN series were inoculated with appropriate aliquots of sample (decimal dilutions). In the first stage of the procedure Bacto-Lauryl-Tryptose Broth was used as growth medium. These tubes were incubated at 35°C for 48 hours, or if gas formation was detectable sooner, for 24 hours. Gas-positive culture were then transferred to Bacto-EC medium and incubated at 44.5°C in a circulating water bath. Gas formation after 24 hours constituted the confirming stage of the test. Fecal coliform isolates were typed by the procedure given in Appendix Figure 1.

Fecal Streptococcal tests were performed on all samples using the "membrane filter" technique (3). Appropriate dilutions of the sample were filtered through a sterile membrane filter by means of a filtration apparatus. The membrane filters were then transferred aseptically to the surface of pre-poured culture dishes containing M-Enterococcus agar. Culture dishes were incubated at 35°C for 48 hours. Bacterial colonies producing a dark red to pink colour were counted using a low-power binocular wide-field microscope, and the fecal streptococcal density calculated per 100 ml.

2.3 Additional Data

Salinity and temperature were determined at selected stations in situ using either the Knudsen Method (4) or a Beckman Induction salinometer, model RS5-3. The tidal stage was estimated and recorded for each sampling run. In addition, records of daily precipitation during the sampling period for Stanhope, P.E.I., were obtained from the Atmospheric Environment Service, Environment Canada,Halifax, N.S.

3. SANITARY CONDITIONS

3.1 Sector I

This Sector includes the major portion of Rustico Bay, as well as Todd Creek and Winter River.

Rustico Bay is bordered on the north by Rustico Island, a large, primarily grass-covered sand dune. The Island has no permanent inhabitants but attracts many campers during the summer months. A large campground, part of the National Park facility, is located at the south-east end of the Island and consists of 148 campsites. The campground is serviced by septic tank and tile fields. A cause-way joins Rustico Island and Brackley Point.

A number of cottages are located on the shoreline to the north of Todd Creek. These are all serviced by septic tank and tile field. A wharf is also located adjacent to these cottages and appears to be strictly recreational in use. Boat traffic observed during the survey period was minimal.

The Winter River drains primarily farming and grazing land and enters Rustico Bay from the south. The village of South Rustico (population 75) is situated immediately west of the upstream portion of the Winter River. Most of the homes are remote from the River and are serviced by septic tank and tile fields; pollution from this source is probably negligible.

Two campgrounds are located on the southern shore of Rustico Bay between the mouth of the Winter River and Grand Pere Point. One contains 80 campsites and the other 60 campsites. Both are serviced by septic tank and tile fields. Several cottages and cabins are also located in this area but these are remote from the shore and do not appear to pose a pollution threat.

No other potential pollution sources were noted in this Sector.

A large shellfish population exists in this Sector, consiting of clams, quauhaugs, mussels and some oysters. Two oyster leases are located between Rusitco Island and Grand Pere Point.

3.2 Sector II

The Wheatley River drains an extensive area composed of farms and woodland. This high rolling hillsides slope to the River and may be expected to make the watershed sensitive to runoff pollution after heavy rainfall.

The community of Wheatley River is located on the upstream portion of the River near tide head and residential and farm buildings closely border the River. Six cottages are located just east of the community and these are being serviced by a 'prototype home sewage treatment plant' with a chlorinated outfall to the river.

Crooked Creek drains another farming area and enters the Wheatley River from the south approximately 2 miles downstream for the village. A large cottage subdivision, comprising approximately 85 acres, is located on the southern shore of the River, just west of the mouth of Crooked Creek. Only a half-dozen cottages were noted, and these are serviced by septic tanks and tile fields.

A second cottage subdivision is proposed for the north shore of Wheatley River, immediately downstream from Crooked Creek, but it has not yet been approved by the Province.

Several individual cottages are also scattered on the bank of the River above Oyster Bed bridge and these are serviced by septic tank and tile fields.

Below Oyster Bed bridge, the Wheatley River empties into the southeast portion of Rustico Bay. Several homes are located on the western edge of the Bay but these are remote from the shoreline. An old, unused wharf is located on the south shore of Rustico Bay just east of Oyster Bed bridge. Several homes are located on the shore between the bridge and the wharf, but no outfalls were observed and these are presumed to be serviced by septic tank and tile fields.

The Robin Hill compground is located just east of the old wharf facility and consists of 156 campsites, of which 20 are serviced. Domestic waste

for this campground is handled by a package treatment plant with a chlorinated effluent discharge to the Bay via an outfall located approximately 1000 feet east of the old wharf. The high shellstock counts observed by the Province during 1975 were obtained from clams dug on this section of the shoreline.

Further east, on the western shore of the mouth of Matheson Creek, a small private campground for retarded children is located. A maximum of 50 people make use of this facility and domestic waste is handled by a septic tank and tile field.

Matheson Creek, a small and shallow stream,also drains farming and grazing land to this portion of Rustico Bay. Several homes and farm buildings are located on its bank near the highway bridge. No outfalls were noted and the homes are presumably served by septic tank and tile fields. A third campground, consisting of 100 campsites, is located on the eastern bank of the mouth of Matheson Creek. Domestic waste is handled by septic tank and tile field.

Another small stream, Smelt Creek, discharges into Rustico Bay further east. This creek also drains a small area of farmland and several houses are located near its bank.

An extensive shellfish population exists in this Sector, consisting primarily of clams, mussels and quauhaugs. These are located mainly in the Wheatley River, both above and below Oyster Bed bridge.

4. BACTERIOLOGICAL RESULTS

4.1 Sector I

This Sector was sampled at 8 sampling stations on six days from June 28 to August 19, 1976. A total of 48 samples were analyzed for fecal coliform bacteria. In addition, fecal streptococci analyses were done on samples from selected sampling stations on July 14. Figure 2 gives the sampling station locations for this area.

Appendix Table A-1 presents the fecal coliform results during the survey period. Figure 3 and 4 present median and maximum fecal coliform distribution respectively, in comparison to the standard of a median of 14 MPN/100 ml and a 90 percentile of less than 43 MPN/100 ml. All sampling stations in this sector easily meet bacteriological water quality criteria for an approved shellfish harvesting area.

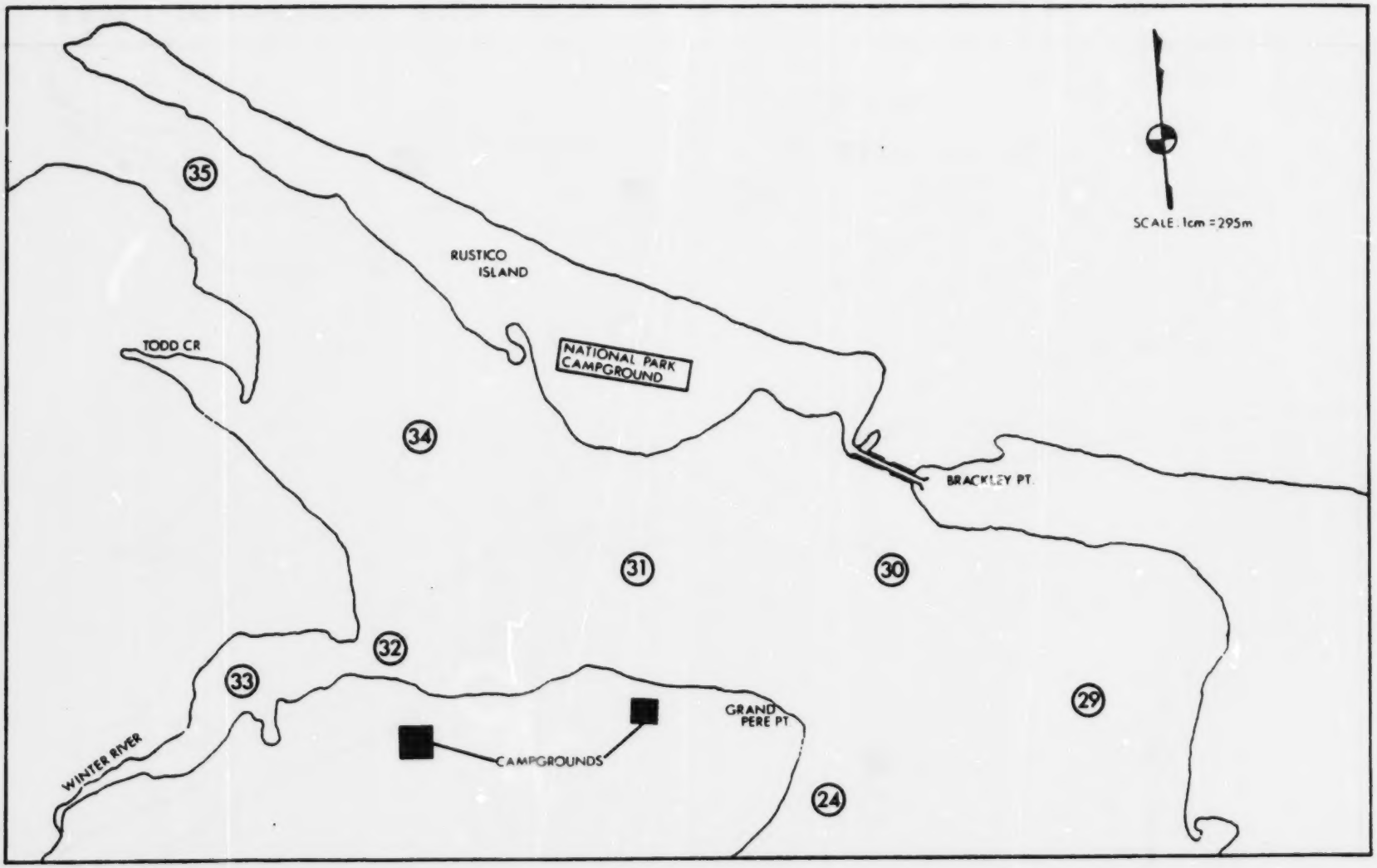

FIGURE 2 MAP OF SECTOR I (RUSTICO BAY), SHOWING LOCATION OF SAMPLING STATION, 1976

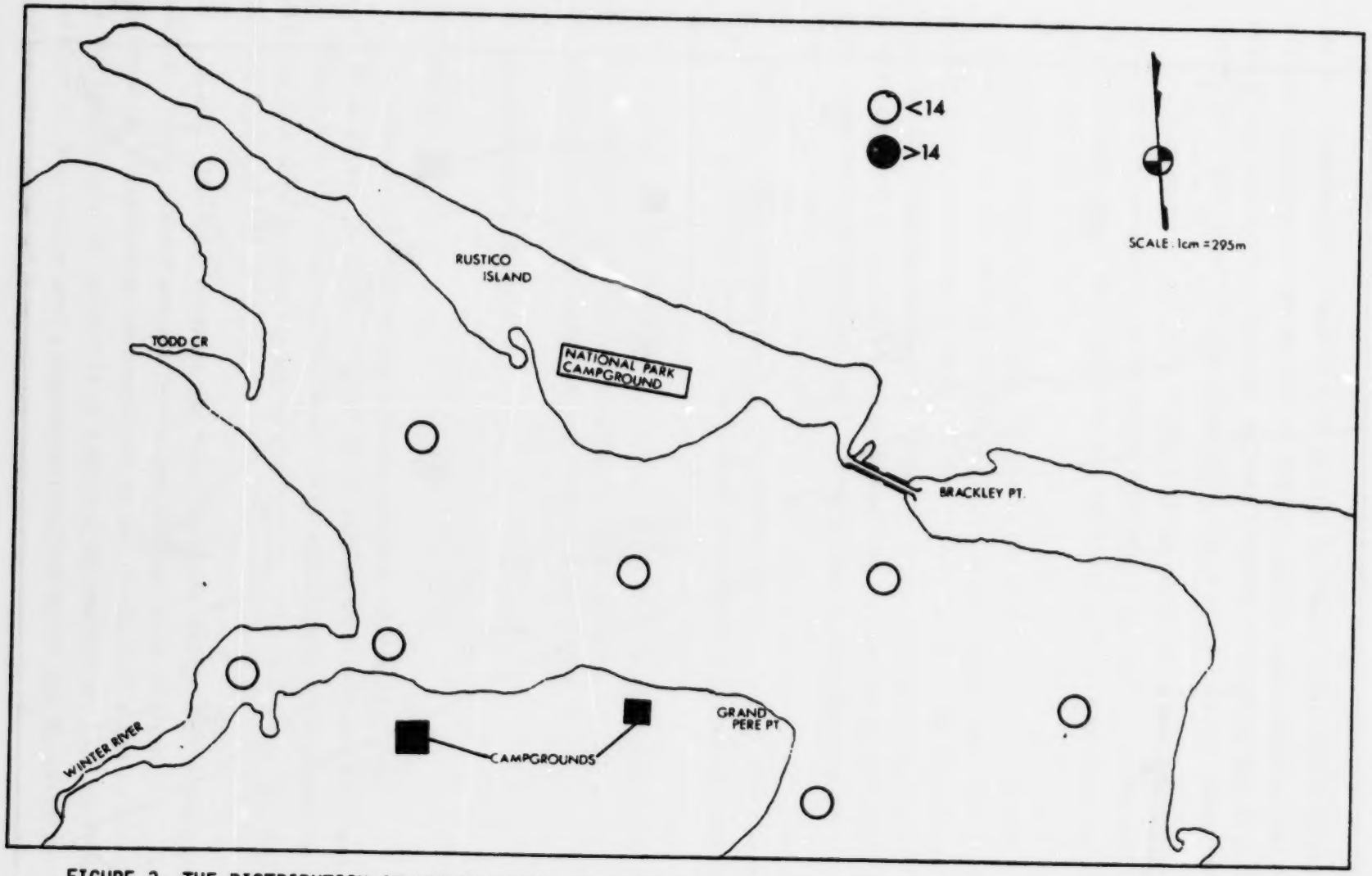

FIGURE 3 THE DISTRIBUTION OF MEDIAN FECAL COLIFORM DENSITIES IN SECTOR I (RUSTICO BAY), 1976

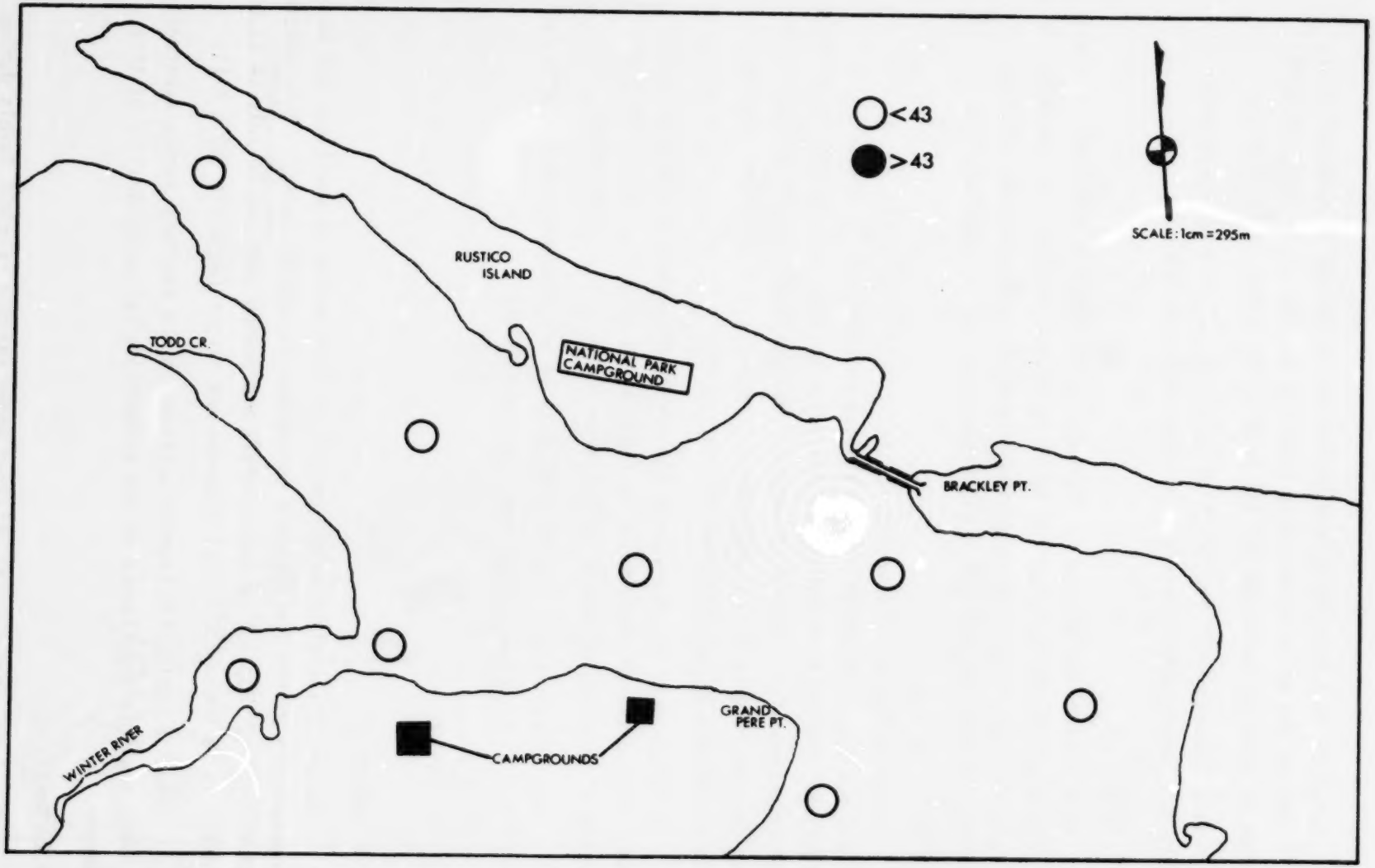

FIGURE 4 THE DISTRIBUTION OF MAXIMUM FECAL COLIFORM DENSITIES IN SECTOR I (RUSTICO BAY), 1976

Rainfall data for the survey period are presented in Appendix Table B-1. During the 48 hours prior to sampling on July 14, a total of 1.08 inches of rain was measured for the area (0.89 inches in 24 hours).

Fecal streptococci results from July 14 are presented in Appendix Table A-3, along with corresponding fecal coliform values.

4.2 Sector II

This Sector was sampled on six days at 23 sampling stations. A total of 138 samples were analysed for fecal coliform bacteria. In addition, fecal streptococci analyses were conducted on samples from selected sampling stations on July 14. Figure 5 gives the sampling station locations for this Sector.

Appendix Table A-2 presents the fecal coliform results during the survey period. The median fecal coliform distribution is presented in Figure 6. All stations have a median value of less than 14 MPN/100 ml with the exception of stations 5, 6, and 7. Maximum fecal coliform levels are depicted in Figure 7. All stations upstream of, and including station 13, exceed the 90 percentile of 43 MPN/100 ml.

Rainfall data for the survey period are presented in Appendix Table B-1. During the 48 hours prior to sampling on July 14, a total of 1.08 inches of rain was measured for the area (0.89 inches in 24 hours).

Fecal streptococci results from July 14 are presented in Appendix Table A-3 along with corresponding fecal coliform values.

5. DISCUSSION

5.1 Sector I

The bacteriological water quality of this Sector is excellent and was consistently within the standard throughout the survey period. Only station 33 showed any response to the rainfall preceeding sampling on July 14 (1.08 inches in 48 hours) and that response was slight (Appendix Table A-1).

Potential pollution sources outlined in the sanitary survey apparently have a negligible influence on the bacteriological water quality of this Sector.

5.2 Sector II

Fecal coliform results obtained under varying rainfall levels during

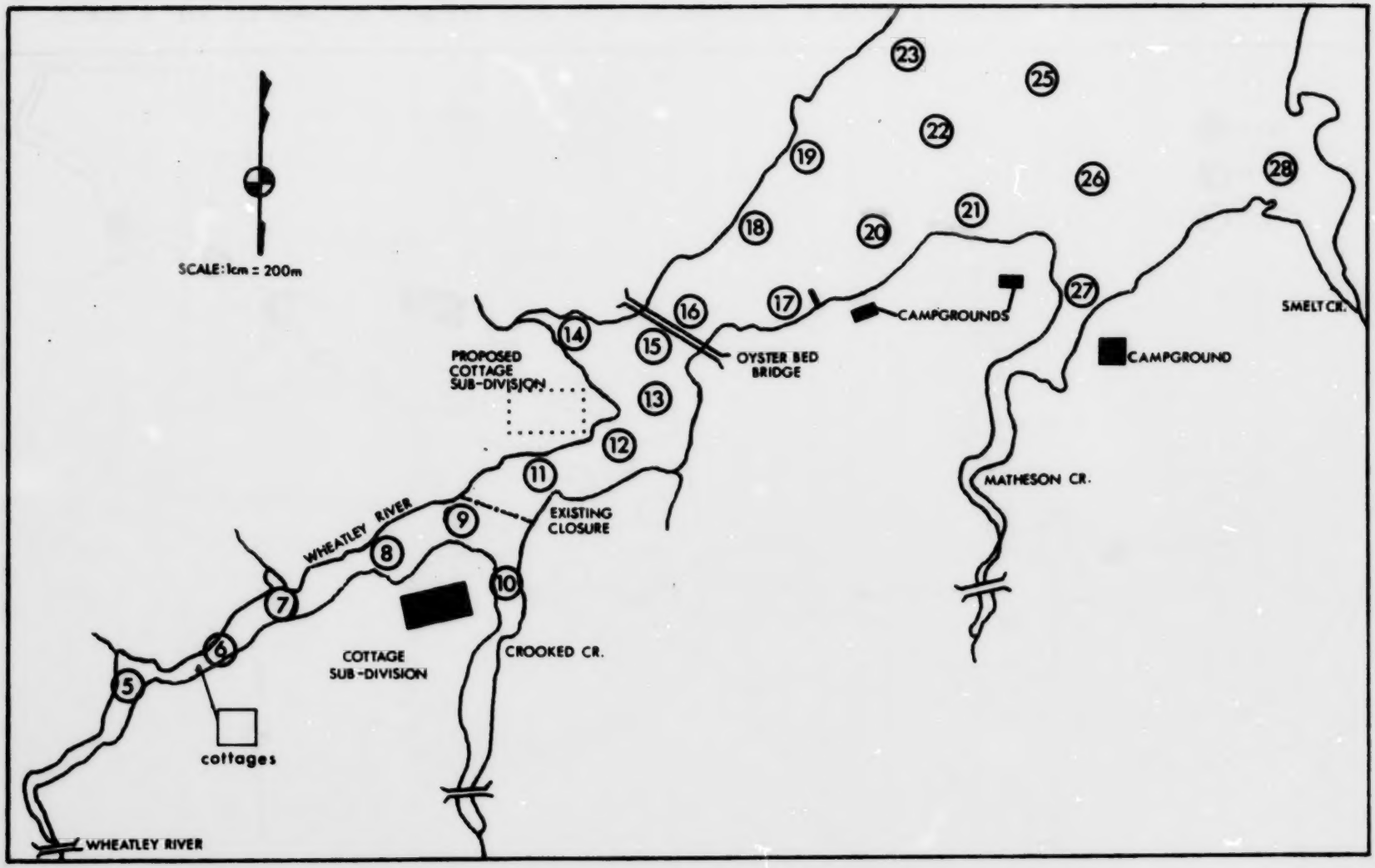

FIGURE 5 MAP OF SECTOR II (WHEATLEY RIVER), SHOWING LOCATION OF SAMPLING STATIONS, 1976

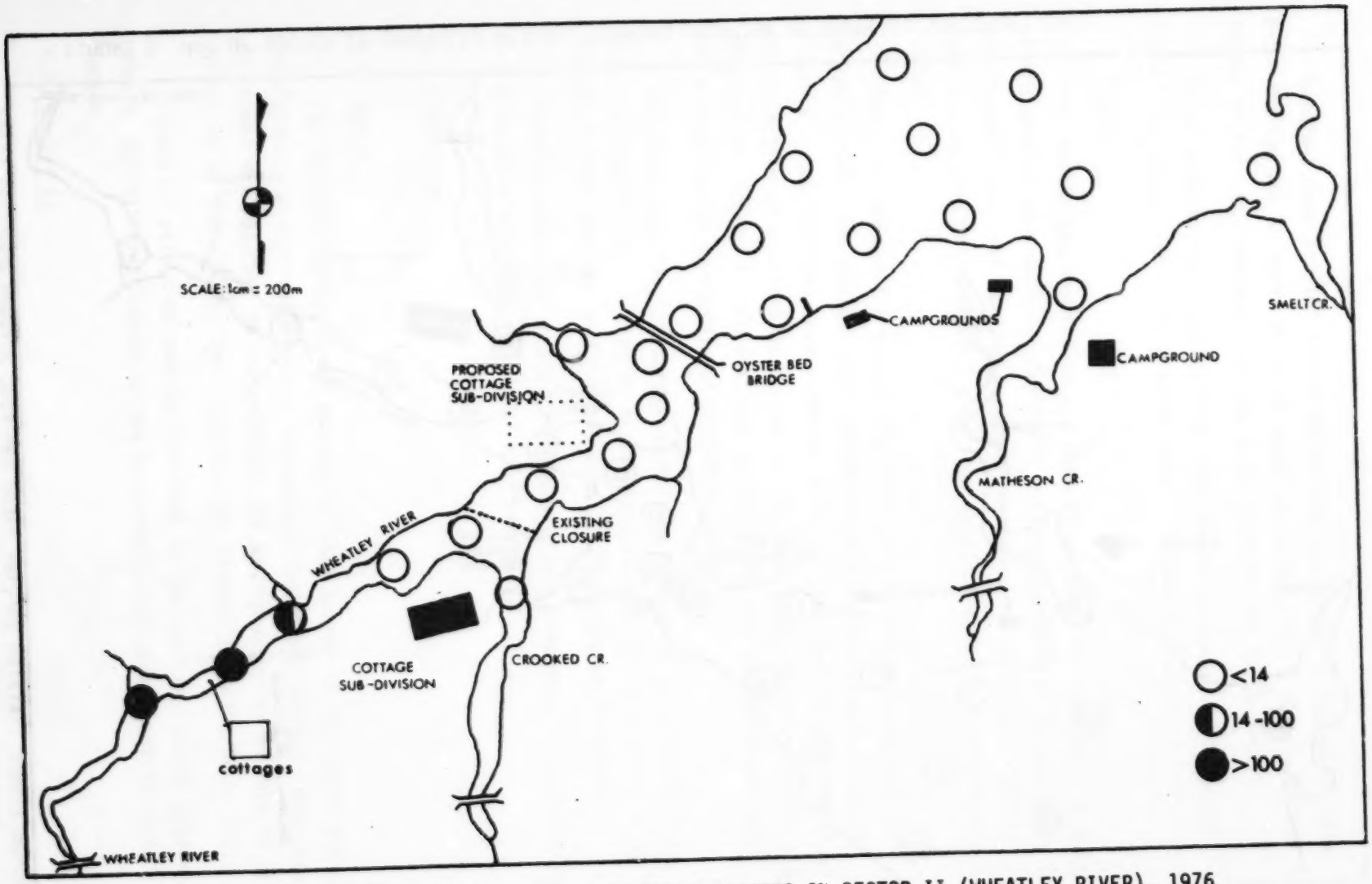

FIGURE 6 THE DISTRIBUTION OF MEDIAN FECAL COLIFORM DENSITIES IN SECTOR II (WHEATLEY RIVER), 1976

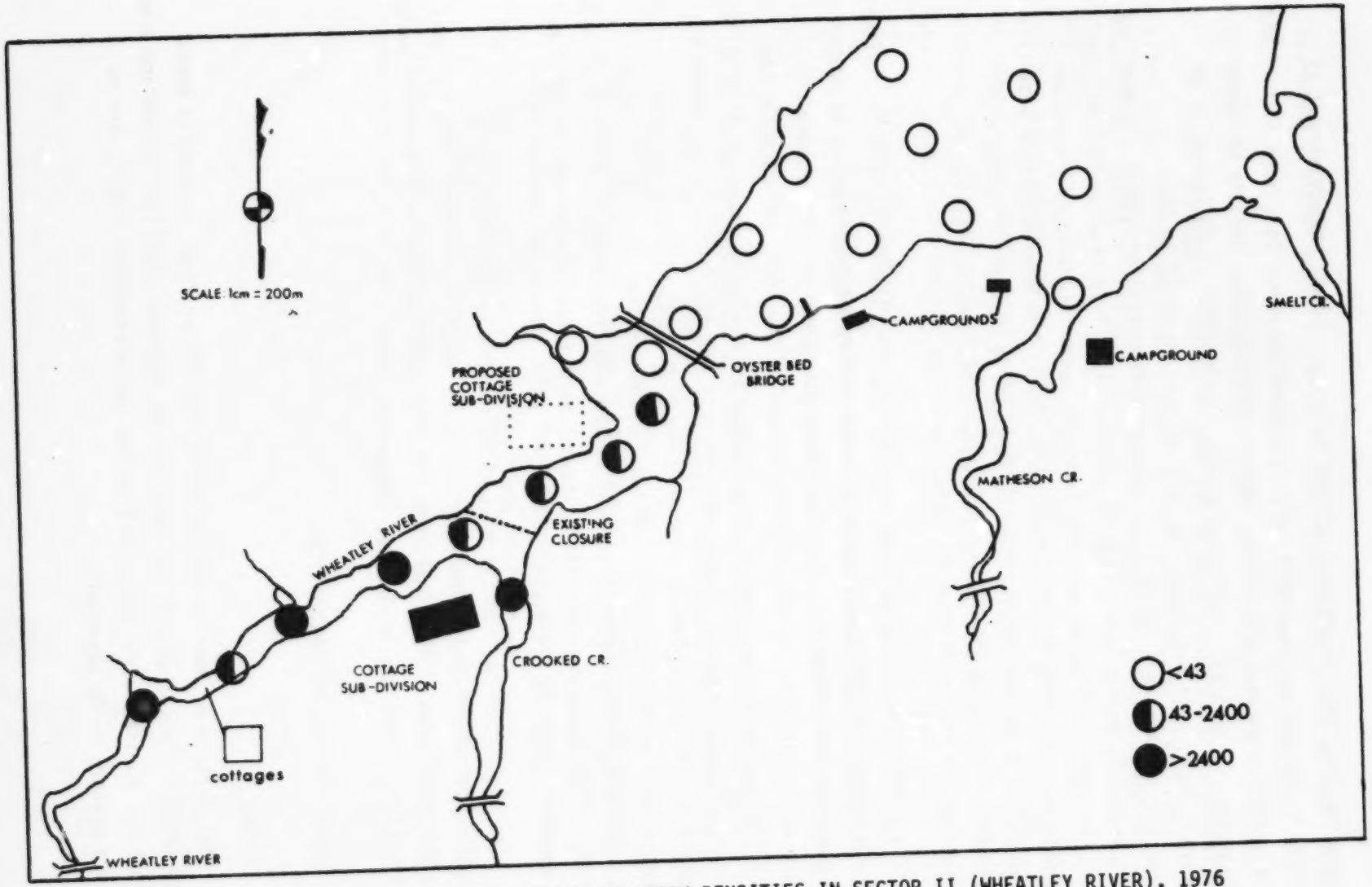

FIGURE 7 THE DISTRIBUTION OF MAXIMUM FECAL COLIFORM DENSITIES IN SECTOR II (WHEATLEY RIVER), 1976

1976 indicate that, following periods of relatively low rainfall (Appendix Table B-1), the upstream portion of the Wheatley River (stations 5, 6, 7 and 8) consistently exceeds established bacteriological water quality criteria (Appendix Table A-2). Following a major storm event (1.08 inches in 48 hours), fecal coliform levels on July 14 were observed to rise drastically (Appendix Table A-2), and individual station counts exceeded the 90 percentile as far downstream as station 13. These results indicate that the existing closure line is more than adequate under dry weather conditions but is inadequate following high rainfall event, i.e., the Wheatley River watershed appears to be extremely sensitive to landwash pollution following heavy rainfall. This observation was also made in the previous survey of this area (1).

Isolate cultures taken from selected sampling station on July 14 confirmed as 97% E coli, indicating that the fecal contamination primarily orginates from warm-blooded animals. No significant potential sources of domestic waste were identified by the sanitary survey of the area, and as such, the fecal contamination measured on July 14 would normally be expected to originate from agricultural runoff. Fecal streptococci results from July 14, however, suggest an entirely different source. The high fecal coliform to fecal streptococci rations (Appendix Table A-3), suggest that the primary source of fecal waste entering the upper portion of the Wheatley River is probably of human origin. This indicates the possibility of an unidentified source (or sources) of domestic waste to the River.

The portion of Rustico Bay east of Oyster Bed bridge included in this Sector meets established bacteriological water quality criteria. The sanitary survey results, however, reveal that a major potential source of domestic waste is the outfall from the Robin Hill campground.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Sector I

This portion of Rustico Bay including the Winter River, currently meets bacteriological water quality criteria for an approved shellfish harvesting area. The present sanitary conditions confirm the bacteriological results and no closure appears to be necessary.

It is recommended that this Sector remain an approved shellfish harvesting area.

6.2 Sector II

The upper portion of the Wheatley River does not meet bacteriological water quality critera following high rainfall events. The possibility of an unidentified source of domestic waste is a serious one and should not be ignored.

The mouth of the Wheatley River and the southern portion of Rustico Bay included in this Sector also meets bacteriolcical water quality criteria for an approved shellfish harvesting area. The outfall from the Robin Hill campground however, poses a significant potential threat of domestic waste discharge.

It is recommended that:

1) The upper portion of the Wheatley River including, and upstream of station 13, be closed to shellfish harvesting as indicated in Figure 8.

2. A small closure be implemented on the southern shoreline 1000 feet on either side of the outfall from Robin Hill campground as indicated in Figure 8.

7 RECOMMENDATIONS OF THE MARITIME STANDING COMMITTEE ON SHELLFISH

The Rustico Bay sector meets bacteriological water quality standards and should remain an approved shellfish harvesting area.

An extension of the Wheatley River closure (3-6) is warranted. The existing closure should be rescinded and two new closures established as shown in Figure 8 of this report.

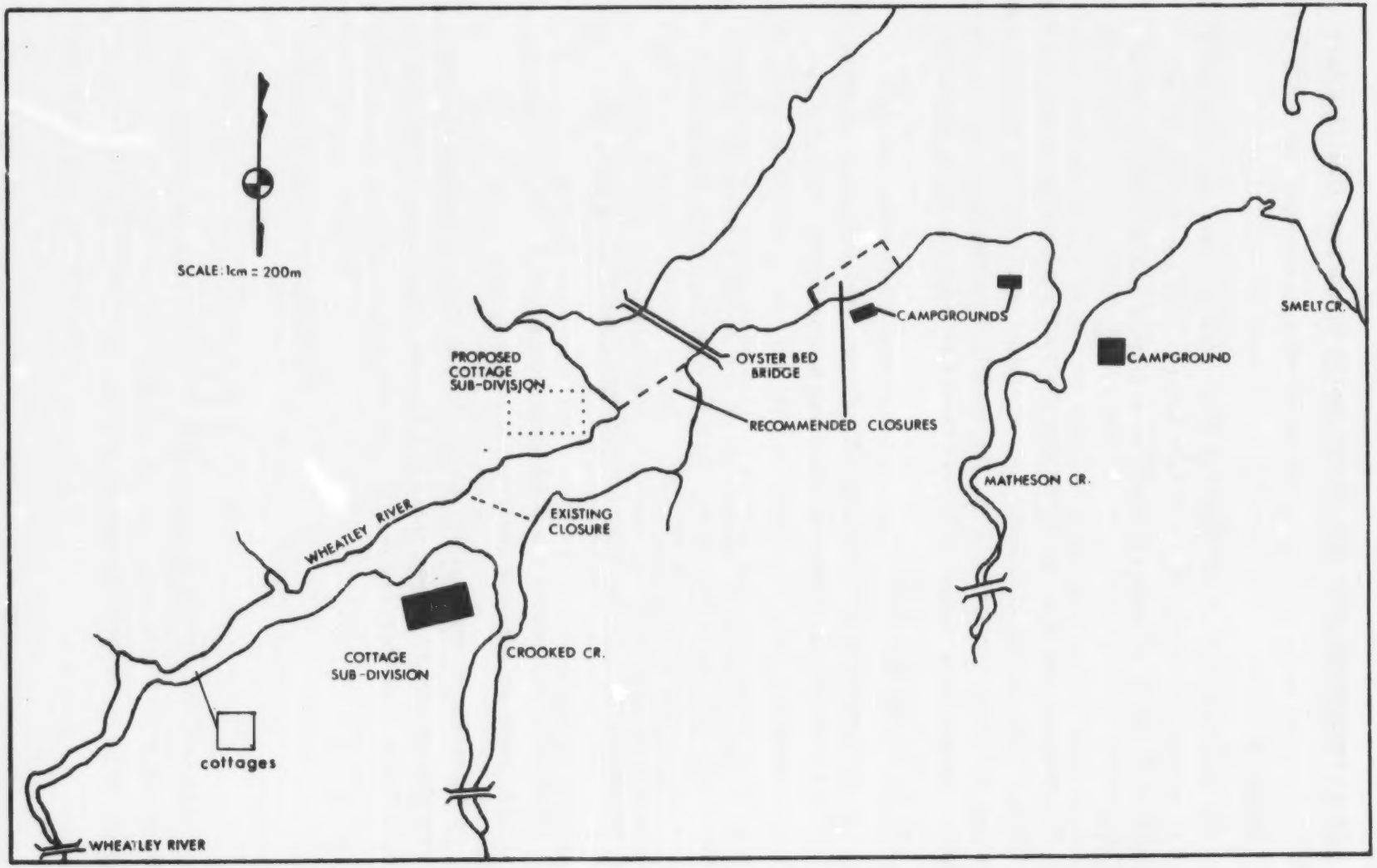

FIGURE 8 MAP OF SECTOR II (WHEATLEY RIVER), SHOWING RECOMMENDED CLOSURE LINE

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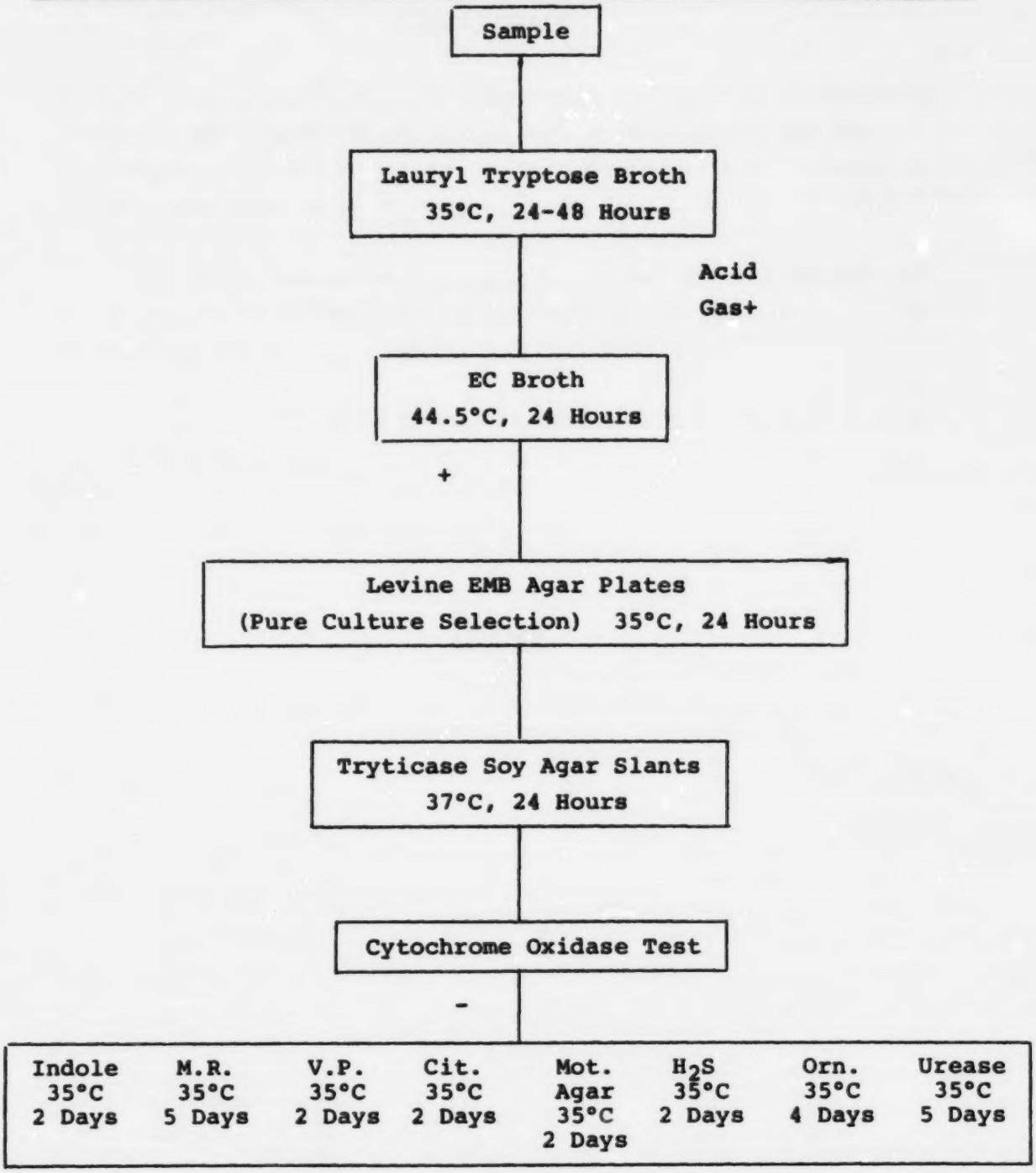
APPENDIX

APPENDIX FIGURE 1 ISOLATION AND IDENTIFICATION FOR FECAL COLIFORM



APPENDIX TABLE A-1 FECAL COLIFORM RESULTS, 1976, SECTOR I (RUSTICO BAY)

SAMPLING STATION NO.	FECAL COLIFORM MPN/100 ML							
DATE TIDE	JUNE 28 L.F.T.	JULY 6 L.R.T.	JULY 14 H.R.T.	JULY 22 L.F.T.	AUG. 3 H.R.T.	AUG. 19 L.R.T.	MEDIAN	MAX.
24	<2	<2	<2	<2	<2	<2	<2	<2
29	<2	<2	<2	<2	<2	<2	<2	<2
30	<2	<2	<2	<2	<2	<2	<2	<2
31	<2	<2	<2	<2	<2	<2	<2	<2
32	<2	<2	<2	<2	<2	<2	<2	<2
33	<2	<2	8	<2	<2	<2	<2	8
34	<2	<2	<2	<2	<2	<2	<2	<2
35	<2	<2	<2	<2	<2	<2	<2	<2

APPENDIX TABLE A-2 FECAL COLIFORM RESULTS, 1976, SECTOR II (WHEATLEY RIVER)

SAMPLING STATION NO.	FECAL COLIFORM MPN/100 ML							
DATE TIDE	JUNE 28 L.F.T.	JULY 6 L.R.T.	JULY 14 H.F.T.	JULY 22 L.F.T.	AUG. 3 H.R.T.	AUG. 19 L.R.T.	MEDIAN	MAX.
5	110	920	>2400	220	46	<2	165	>2400
6	210	350	1600	350	9	<2	280	1600
7	70	14	>2400	79	4	<2	42	>2400
8	11	11	>2400	49	7	<2	11	>2400
9	<2	2	350	2	2	<2	2	350
10	8	49	>2400	7	<2	<2	7	>2400
11	8	4	170	2	<2	<2	3	170
12	4	17	350	<2	<2	<2	3	350
13	2	<2	540	<2	<2	<2	<2	540
14	<2	<2	11	7	<2	<2	<2	11
15	<2	2	2	<2	<2	<2	<2	2
16	<2	2	5	7	<2	<2	<2	7
17	2	2	2	<2	<2	<2	<2	2
18	2	<2	<2	<2	4	<2	<2	4
19	<2	<2	<2	<2	2	<2	<2	2
20	<2	<2	<2	2	<2	<2	<2	2
21	<2	<2	4	<2	<2	<2	<2	4
22	2	<2	5	<2	<2	<2	<2	5
23	<2	<2	<2	<2	<2	<2	<2	<2
25	<2	<2	<2	<2	<2	<2	<2	<2
26	<2	<2	17	<2	<2	<2	<2	17
27	<2	<2	<2	5	<2	<2	<2	5
28	2	<2	<2	<2	<2	<2	<2	2

APPENDIX TABLE A-3 FECAL STREPTOCOCCI RESULTS, WHEATLEY RIVER-RUSTICO BAY, JULY 14, 1976

SAMPLING STATION	MPN FECAL COLIFORM/100 ml	MF FECAL STREPTOCOCCI PER 100 ml	FC/FS RATIO
6	1600	84	19.0
8	>2400	51	>47.1
10	>2400	80	>30.0
12	350	42	8.3
16	5	<1	-
22	5	<1	-
27	<2	<1	-
33	8	10	0.8

APPENDIX TABLE B-1 PRECIPITATION DATA, STANHOPE, P.E.I., ATMOSPHERIC ENVIRONMENT SERVICE, ENVIRONMENT CANADA, HALIFAX, N.S., JUNE - AUGUST, 1976

DAY	JUNE		JULY		AUGUST	
	RAIN INCHES	SAMPLING DAY	RAIN INCHES	SAMPLING DAY	RAIN INCHES	SAMPLING DAY
1	0.06		0		0.08	
2	0		0.24		0	
3	0		TR		0	X
4	0		0		0	
5	0		0		0	
6	0.06		0	X	0	
7	0		0		0	
8	0.27		0		0.27	
9	0		0		0.52	
10	0		0		0.05	
11	0		0		0.10	
12	0		0.19		0	
13	0.70		0.17		0	
14	0		0.72	X	0	
15	0		0.15		0.13	
16	0		0.05		0.75	
17	TR		0		0	
18	0		0		0	
19	0		0.06		0	X
20	0		0.01		0	
21	0		TR		0	
22	0		0.07	X	0	
23	0		0		0	
24	0.11		0		0	
25	0.46		0		0	
26	0		1.46		0	
27	0.10		0		0.46	
28	0	X	0.06		0.02	
29	0.15		0		0.63	
30	0		0		1.56	
31	0		0		0	

TR = TRACE (<.01")

APPENDIX TABLE B-2 SALINITY AND TEMPERATURE RESULTS WHEATLEY RIVER - RUSTICO BAY, 1976

SAMPLING STATION	JUNE 28 L.F.T. SAL. 0/00	TEMP. °C	JULY 6 L.R.T. SAL. 0/00	TEMP. °C	JULY 14 H.F.T. SAL. 0/00	TEMP. °C
9	23.5	18.0	24.3	19.0	20.9	23.0
16	23.7	17.8	25.0	18.4	26.8	22.8
22	27.7	17.0	26.4	18.1	26.5	22.2
31	27.7	17.0	26.4	18.0	27.6	22.4

SAMPLING STATION	JULY 22 L.F.T SAL. 0/00	TEMP. °C	AUG. 3 H.R.T SAL. 0/00	TEMP. °C	AUG. 19 L.R.T. SAL. 0/00	TEMP. °C
9	24.7	20.0	24.6	20.0	20.1	18.0
16	25.9	19.7	28.2	18.2	19.5	17.8
22	27.6	19.0	26.9	18.0	26.9	17.2
31	27.6	19.0	26.1	18.0	27.7	17.1